

'On the Pathology and Etiology of Elephantoid Disease,'

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Introduction

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May not since leaving Alma Mater having been East in China, I have sought in the following pages to utilize the opportunities thus enjoyed, of studying the recent rapid advances made in our knowledge of the Pathology and Etiology of Elephantiasis Arabum and allied diseases. The interesting communications made to the Chinese Imperial Maritime Customs Medical Reports from time to time, by Dr. Morrison of Amoy (neighbouring port to Fuchow) early attracted my attention, and leisure hours have been employed in initiating myself into the knowledge of his, and others' researches, and seeking confirmation of conclusions therein arrived at, in my own practice. Elephantiasis Arabum is not very prevalent in city of Fuchow, or immediate neighbourhood. Majority of cases, presenting themselves at hospital for treatment, come from country towns and villages from five to one hundred miles distant. Opportunities for studying the disease are afforded by a Native Hospital having an average annual attendance of about 450 In- and 2000 Out- patients.

Under the somewhat ambiguous term "Elephantiasis disease" it is proposed to include the several affections of Elephantiasis of leg and Scrotum, Lymphoedema, varicose glands and Chyluria. In doing so, I accept as allowed, evidence which later on shall be adduced to prove that these several diseases are but disease manifestations of one pathological condition, their difference being merely one of site, and degree of involvement. I leave for a Greek scholar the selection of a happy term to express in brief "Disease, endemic in certain tropical countries,

Resume of literature of *Hydrobia ulvae*

occasioned by obstruction to lymph circulation in localized lymphatic areas".

"Pneumia tropica, Elephantiasis Arabum, Maraboutes leg, Cochini leg, Sprungas, Dat Fil of the old Arabian physicians has been a recognized pathological condition for centuries. Not so however with lymph scrothum or Chyluria, which have only been separated out from the compound mass of disease within the past thirty years. To Mr. Ardenas Janse, of Bombay, belongs the credit of recording the first case of lymph scrothum, of the Medical & Physical Society of Bombay" 1854, under title of "partial hypertrophy of scrothum attended with a peculiar eruption and discharge" he details the particulars of case, remarking that

"in consequence of a milky discharge from vessels developed in scrothum no increase of hypertrophy occurs". In this instance lymph scrothum was evidently associated with Elephantiasis. The first notice of the disease was made by Dr. Wemyss of Canton, several illustrative

Hospital Report for 1858.

Cases being reported, under the heading "milky exudation from scrothum".

Dr. H. V. Carter, of Bombay Medical Service, by an able article entitled "Varix lymphaticus" brought the disease prominently before the profession. He discussed in full its pathology, recognized its very frequent coexistence with Elephantiasis Arabum and Chyluria, and gave it as his opinion that the disease was "part of a deep seated affection of the lymphatics placed along the iliac vessels and abdominal aorta as far as the root of the mesentery, the lymph, or chyle, regurgitating through dilated lymphatics of scrothum inducing Varix lymphaticus". Further notice of lymph scrothum was made by Dr. Haynes, of Calcutta. Detailing several illustrative cases under heading "Nervoid Elephantiasis"

= Vol. VII (new series) of the Transactions of the Medical & Physical Society of Bombay. 1861.

"Clinical Surgery in India" by Dr. Haynes. 1866.

Clinical description of 'Lymph Proliferation'.

he expressed the belief that the disease was but "a peculiar form of Elephantiasis". In 1870 Dr. J. Lewis, of Calcutta, by his discovery of 'Filaria sanguinis hominis' gave new interest to the study of the whole range of Elephantoid disease. Dr. Munn, of Army, recognised the disease for first time in his native practice, in 1871. Unaware of previous descriptions he records his cases under the name of 'Lympho Scrothum'. This name I think, is a good one, not only as supplying a key to the pathology of the disease, but to anyone who has seen hyaline cases, the peculiar semi-transparent plastic appearance of the lymphaden tissue of Scrothum well suggests the term of 'Lympho Scrothum'.

"Medical Report,
+ Chinese Imperial Maritime
Customs." July Sept. 1871

Cases of Lympho Scrothum, in my opinion, afford by far the most valuable field for the elucidation of the true pathology and etiology of Elephantoid disease. The following clinical sketch of the disease, is drawn from my study of it in Fochow:

A male, past age of puberty, in enjoyment of good health or perhaps subject to attacks of malarial fever, after exposure to cold and wet or without such history, is seized with fever. ushered in with rigors, pain in back and general malaise, the fever after lasting from a few hours to perhaps one or two days, is followed by pain, redness, and swelling of Scrothum. Inguinal glands at some time become enlarged but are not as a rule painful. The inflammation of Scrothum may be very severe, be complicated by occurrence of abscess in cellular tissue, and compel patient to keep his bed for many days, or on other hand may be so slight as to but slightly modify

incommence him whilst continuing at his daily work.
With the onset of inflammatory symptoms in Scrothum the fever
rapidly abates, and the general constitutional disturbance is
resolved into a local inflammatory affection. If Scrothum
be seen in this acute stage we should find, over and above
inflammatory swelling, numerous gorged lymphatic vessels
covering its surface. In a few cases, of marked severity, rupture
of these vessels may occur in this primary attack and escape
of a sanguinous fluid results, with marked relief to pain
and swelling. As a rule however all swelling spontaneously
subsides within a few days, the inflamed skin desquamates,
and patient appears perfectly well. This first attack of fever
in a few cases proves also the last, subsequent history of
case consisting in a gradual development of vesicles on
surface of Scrothum, periodic increase in swelling ending
in rupture of vesicles and discharges of lymph, with
temporary relief to symptoms. In great majority of cases
however the first seizure of fever proves but the precursor
of many. At irregular intervals, varying from many
times a year to once every one or two years, fever recurs,
and all the phenomena of first attack are repeated in
gradually increasing degree of severity; pain & redness
decreasing with each subsequent seizure, while swelling
is increased. Skin of Scrothum gradually becomes
thickened, and after repeated attacks of fever gorged
and tortuous lymphatic vessels are found mending their
way over entire anterior, and most dependent, surface, with

Physical Characters of a typical 'Lymnaea stagnalis'.

5
vesicles formed here and there at points of exaggerated dilatation (probably the seat of valves). Skin of penis is very frequently involved. During the periodic exacerbations of swelling, the vesicles on surface of scrotum, either spontaneously or from abrasion of clothes, rupture, and an escape of lymph. Clear straw coloured, sanguineous, or milky in character, occurs, with marked relief to pain & swelling. On puncturing such a vesicle the lymph at first may be seen spurting as from a small artery, and dribbling continues for several hours each time. If such discharges occur frequently patient's general health suffers. If not he is merely inconvenienced by his disease.

Examination of a typical case of lymph scrotum, established for several years, will reveal the following characters. Scrotum is twice or more its normal size. Skin is thickened and has a peculiar semi-transparent hydropic appearance. Cutaneous surface of scrotum, and frequently also of penis, is one conglomerate of dilated, tortuous lymphatic vessels gorged with lymph, and presenting here and there numerous vesicle like protuberances. To touch, the skin has a soft blastic feel. Inguinal glands are much enlarged, and as a rule varicose, having to touch a peculiar wormy feel, perfectly suggestive of an aggregation of dilated tortuous lymphatic vessels with little or no connective tissue between.

The above description applies to patient as he presents himself at hospital after having been in erect posture for some time. Keep him strictly in recumbent posture for 24 hours,

The relation of *Lymnaea stagnalis* to *Elephantiasis Arabum*.

and on examination will find Scroton much reduced in size, with scarcely any trace of massive lymphatics or vesicles to be seen on surface. Variety of Inguinal glands also all but disappears.

Lymph Scroton may continue lymph Scroton and nothing more throughout patient's lifetime. By far the greater majority of cases however, as far as my experience teaches, merge in Elephantiasis of Scroton. After the disease, with all the characters described above as typical of lymph Scroton, has existed for a few months or years, patients will tell you the lymph discharges became gradually scantier and of less frequent occurrence, while scroton slowly became "more large, more large". Lymph soon ceases altogether to escape and the characters of lymph Scroton are lost in those peculiar to Elephantiasis Arabum.

In Appendix several cases illustrative of this Affection are recorded. Cases II and III⁺ illustrative were the intimate relationships existing between lymph Scroton and Elephantiasis.

Modern writers now regard the two diseases as but varied phases of one pathological condition. It may be well here briefly to examine the grounds for such a decision.

D. H. V. Carter⁺ in his article on 'Varying lymphatics', before referred to, observes that the two diseases present certain analogies, "their endemicity, their occurrence in the same localities, their common seat, their association with a peculiar and apparently similar febrile condition, the frequent occurrence of inflammation & abscess in the course of both diseases,

⁺ Vol. III, New Series of the Transactions of the Medical and Physiological Society of Bombay. 1861.

and the implication of the lymphatic glands in both.

Dr. Mearns[†] extends these analogies somewhat stating that the diseases lymph scrofula & Elephantiasis are but the "same disease in slightly different forms, or at different steps, for the following reasons, 1. Both diseases attack the same part, the scrofula.

" 2. Both are accompanied by the same kind of fever & inflammation.

" 3. Both primarily involve the lymphatics.

" 4. Geographical distribution of both diseases, as far as known, is identical.

" 5. Course of both diseases is similar.

" 6. Both sometimes occur in the same individual together or one after the other."

Taking the history of numerous cases of Elephantiasis Scrofula, it very soon strikes the observer how large a number present a history of lymph discharges in early period of their course. In 90% of lymph scrofula removed by operation, & examined, if carefully made, of cellular tissue will reveal more or less of that semi gelatinous semi fibrous tissue so characteristic of Elephantiasis Arabum. The pathology of lymph scrofula is very obvious. Varicocity of lymphatic vessels in a certain area must depend on localized obstruction to lymph circulation. ~~with consequent~~ An obstruction gradually developed and incomplete, as recurrent position permits disengagement of lymphatics.

Elephantiasis Arabum is now admitted by all modern writers to be a disease occasioned by localized obstruction to lymph circulation with consequent stasis of lymph and

[†]"Chronic Inflammatory Diseases"
Cutaneous Medicine Report for
Apr. Sept. 1875.

organization of same, in cellular tissue of affected part, into a new form of tissue. Granting then a similar pathology to lympho scurvy and Elephantiasis, how comes it that in former we have variety of lymphatic vessels with periodic discharges of lymph, and in latter a new form of tissue developed? The answer, perfectly satisfactory to my mind, has been given by Dr. Munnich. I give it in his own words

"The cause of the difference between Elephantiasis and lympho scurvy is, I believe, not different to find. Assuming that in both there is obstruction to the circulation of lymph, I would suggest that in the case of lympho scurvy the obstruction is not complete, that the upward progress of lymph, though retarded, is not thoroughly arrested and that it is kept fluid by being allowed thus to circulate, just as the blood is in veins made narrower by obstruction. Or perhaps the obstruction above may

be complete, but yet a movement of the lymph is allowed by the rupture of a vessel on the surface of the scurvy, and it is thus prevented from stagnation and coagulation. On the other hand in ordinary Elephantiasis, I conjecture that the obstruction is complete, or nearly so, and that there is no rupture of vessels on the surface. In consequence of this there is complete stagnation of lymph; it coagulates, and eventually becomes organized into degraded forms of the tissue in which it has accumulated."

Elephantiasis might then be said to be the result of acute obstruction to lymph circulation, lympho scurvy the result of chronic.

*may be temporarily complete, or

nearly so, would I think be the

more correct phrase. When obstruction

does become complete then lympho

scurvy merges into Elephantiasis

Chyluria.

Chyluria is a condition in which chyle, a milky fluid containing fat and other nutrients, is present in the urine. It is usually caused by damage to the lymphatic system, which is responsible for carrying chyle from the intestines to the rest of the body. The most common cause of chyluria is a congenital defect of the lymphatic system, but it can also be acquired as a result of infection, trauma, or surgery. The condition is characterized by the presence of a milky or white color to the urine, which is due to the presence of fat. Other symptoms may include abdominal pain, diarrhea, and weight loss. Chyluria is a rare condition, but it can be a serious complication of certain diseases, such as lymphoma or tuberculosis. Treatment of chyluria depends on the underlying cause, but it often involves dietary changes, such as a low-fat diet, and the use of medications to reduce the production of chyle. In some cases, surgery may be necessary to correct the underlying defect of the lymphatic system.

In the first case illustration of lympho scrothum, given + vide Appendix Page I. in Appendix, the nature of the lymph discharge, from punctured vessels, claims attention. It was milk in appearance, resembling also in microscopic characters ordinary chyle obtained from lacteal vessels or glands. The whole subject of Chylous discharges has been ably discussed of late years. Of 32 cases of lympho scrothum recorded by Dr. Munnix, and in which characters of lymph are noted, 17 I find present 'milky' discharges. Chyle, or rather milky lymph, has been observed escaping from ulcers in Elephant's legs and from other parts of body, than scrothum.

Dr. Roberts⁺ describes a case of a chylous discharge occurring ^{*Practical treatise on lymph and} from a cluster of vesicles situated the lower part of abdominal ^{Perut. discessu" by Dr. Roberts (1773)} wall. Chyle in urine, or Chyluria, has been a subject of much speculative enquiry and is of special interest inasmuch as affording the field in which 'Feline sanguis hominis' were first ~~discovered~~ discovered. To Dr. Carter belongs the credit of pointing out the true pathology of Chylous discharges. Lymphatic vessels in certain areas are rendered inactive by some localized impediment to lymph circulation. One or more of the main lymphatic trunks carrying lymph from this area into Thoracic duct becomes involved, its valves are rendered incompetent, and reabsorption of Chyle from Thoracic duct is permitted. During the periodic exacerbations in action of cause obstructing lymph circulation, one of the trunks, and therefore weakened, lymphatic vessels yields to the exaggerated internal tension, bursts, and an

Pathology of Elephantiasis Arabum.

escape of lymph occurs, milky in appearance from admixture with contents of thoracic duct. In Chyluria the affected lymphatics may be those of kidney, ureter, or bladder. Dr Roberts* while accepting Dr Carter's theory of rupture of various lymphatics does not admit the reabsorption of chyle from thoracic duct, but supposes active hyper trophy of the affected lymphatics, and assumption by them of the properties and functions of lacteal vessels and glands.

* Practical Treatise on Urinary & Renal diseases by Dr Roberts (1872).

The Pathology of Chyluria is thus identical with that of Lymph Scrotum, difference being merely one of site in operation of cause obstructing lymph circulation. Through lymph Scrotum Chyluria is also afflicted with Elephantiasis Arabum.

Before entering on the discussion of the Etiology of the several affections of Lymph Scrotum, Chyluria and Elephantiasis Arabum, which we now feel justified to group under the single, though inexact, name of 'Elephantoid disease', it may be interesting to glance for a moment at the ideas formerly entertained regarding the Pathology of Elephantiasis Arabum.

The lymphatic theory of Elephantiasis is of but modern acceptance. Obstruction to venous return of blood, was long regarded as cause; hypertrophy of the affected part resulting from excess of arterial blood detained in tissues. Accordingly, ligature of the femoral artery was the orthodox treatment of the 'big leg'. Extended experience of this treatment proved

The fallacy of the theory on which it was based. "Seldom or never now, I imagine, is this operation ever performed either in India or China. Some again have held that Elephantiasis consisted of a true hypertrophy of connective tissue "a transmitted hereditary tendency to hyperplasia". Dr. Allen Webb in a "Surgical Glossary (H.M.S. Circular 1873)". paper on Elephantiasis Orientalis says, "Indeed the disease neither originates in lymphatics or in phlebites, but is formed exterior to the vessels (Nov 4 April 1855). by nuclei which develop themselves into mixed fibro-cellular & elastic tissue, enclosing albuminous fluid. In fact we shall see that the disease is essentially fibrous outgrowth from albuminous blastema". True enough, but may not these albuminous blastema, as Dr. Manson partly remarks, be formed in, and obtained from, the affected lymphatics of part? (M. - Sept. 1875)

Dr. Grassman Wilson regards elephantiasis as a chronic cellulitis of Diseases of the Skin by
which at times assumes an eripielation type. Grassman Wilson F.R.S. 1867, p. 391.

The evidence in favour of the lymphatic nature of the disease however, is clear & convincing. The stream of lymph creeping on cutting through the affected skin and cellular tissue in the operation for removal of 'big scrotum' is sufficient to convince the most sceptical. The numerous gaping lymphatics on the cut surface of removed part admit easily of the passage of a probe. As far back as 1784 the lymphatic nature of elephantiasis was clearly pointed out, though without due recognition. In that year Dr. J. Hendry of Barbadoes "A Treatise on the glandular disease" details the case of a patient whose leg was amputated for elephantiasis and where on examination of the limb in the lymphatic system by after removal, a lymphatic vessel was found in top of foot sufficiently dilated to admit a large quill with ease. The

Life history of *Filaria bancrofti*

other lymphatic vessels were so weakened in their walls as to render them incapable of sustaining a quicksilver injection.

Having discussed thus briefly, the pathology of "Elephantoid disease" and arrived at broad conclusions that its varied manifestations are results of localized obstructions to circulation of lymph, our enquiry must now be directed to the immediate cause, or causes, of such obstruction.

The etiology of elephantoid disease is at present the subject of some discussion, and there is still considerably in advance of well established facts. Two principal theories at present exist a meridian. The first and earliest, asserts that "the inflammation of the lymphatics, the local pain and engorgement swelling, and the subsequent deposition of albuminous matter, constituting elephantiasis, is a sequence or result of fever of a malarious origin". The second, and more modern, assigns a local origin, "Elephantoid disease is the result of the presence, at one time or other, in the tissues of the affected individual of an Entozoon, the Filaria Bancrofti".

* "Elephantiasis" by E. J. Waring Esq.
Vide "Indian Annals", No. 13.

Before examining the evidence advanced in favour of these two theories respectively it will be advisable to give a short resume of the facts known regarding this Entozoon, its life history habitat &c. Its presence in the tissues of man was first intimated by discovery of its embryos in chylous urine. To Dr. J. Lewis, of Calcutta, belongs the true credit of such discovery. Earlier observations seem indeed to have been made, but from imperfect descriptions on part of observers, and lack of confirmation by others,

attention to the subject was never obtained.

In 1843 Klenke[†] records finding 'worms' in the blood of a patient suffering with 'Tropical Disease' by Fayes from vertigo. He gives no descriptive features of same.

In 1866 or 1868, Dr Wachter² of Bahia discovered a worm in the urine of a patient suffering from haemato-chyluria. It was alive and described as 'narrow at one, obtuse at the other extremity'.

In 1868 Dr Salisbury³ in the United States detected a small 'entozoon' in the bladder of a patient suffering from Chyluria. Considering it a new species he named it 'Trichina bythos'.

Dr Lewis' discovery was made in March, 1870. The embryos were found in the urine of an East Indian patient suffering from Chyluria. Repeated observations of the urine of a large number of patients suffering from Chyluria, showed a remarkable association of the filariform embryos with this disease. In 1872 while examining the blood of a patient, ill with chancre, Dr Lewis discovered that there also embryos were to be found present. Subsequent examinations of blood from Chylurians patients showed that there, as in urine, filariform embryos were all but constantly present. Believing the blood to be their proper home Dr Lewis named the embryos, 'Filariae sanguinis hominis'. He supposed them to be the cause of Chyluria. The general attention Dr Lewis' discovery claimed soon resulted in discovery of the parent worm.

The Filaria Bancrofti, called so by Dr S. Bancroft, was first found, in 1876, by Dr Bancroft of Australia, in pus from a lymphatic abscess of arm. A few months later Dr Carter in India confirmed the discovery, finding the parent worm

present in fluid from hydrocele of the spermatic cord and also, as in Dr Bancroft's case, from lymphatic abscess of arm.

Dr Lewis, in 1877, found 2 specimens in blood clot from a patient in whom he had operated for Elephantiasis scroti, associated with varicose lymphatics. Dr Arango, Dr Don Santos, and Manson, have also verified the discovery. * Vide "Tropical Diseases" pages

Filaria Bancrofti belongs to the 'Nematodes'. It is one of the same family as the *Ascaris*, *Strongylus Gigas*, *Filaria Medusarum* (Guinea worm), *Trichina* etc. The mature female worm was found by Dr Bancroft, and described as in length $3\frac{1}{2}$ in. in breadth 1". Dr Manson* found the worm alive, and describes it as "a long slender worm, of a catgut or pale line look, the thickness of a medium sized horse hair". In his case also, the sex was female and the uterine tubes were found packed with embryos "lying at full length, articulated as we see them in the blood". "The body of the mature worm was quite plain, without any markings, and tapered rather abruptly to the simple somewhat club shaped mouth". From examination of uterine tubes Dr Manson decided that *Filaria Bancrofti* is Simplicioris. The habitat of the parent worm is indicated in Dr Manson's case. The patient suffered from lymph scrotum, and owing from certain features present in case Dr Manson thought it extremely probable he should find the worm present in scrotum. His prognosis was verified. First examination of the removed portion revealed nothing, but on taking it up a second time and examining cut surface the

* Vide Chinese Customs Medical Report, Sept 1880.

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worm was found to have wriggled half out of an enlarged lymphatic vessel. About 2 in. of it were free and displayed vigorous movements, the remainder still occupied the calibre of the lymphatic. From this find, and also from facts, viz that filaric embryos are frequently found present in lymph while blood may be perfectly free of them, and that we have been detected in the lymph, Dr. Manson concludes that the lymphatic trunks are the habitat selected by the mature worms. Situated thus, in close proximity probably to a male worm, the female discharges her embryos from time to time into the lymph circulation. Carried through the lymphatic glands into the thoracic duct, they enter, with the chyle, the left subclavian vein and find a home in the blood.

The numbers present in the blood must be immense. No less than 260 embryos have been counted in a single drop of blood. This at a reasonable estimate, would represent the presence of over 3,000,000 embryos in such a patient's blood.

= Filaria chancina in South
Formosa by Dr. Myers. Vide
Chinese Customs Med. Rep. March 1901

Under the microscope embryo filaria present appearance of little snakes like worms wriggling about in a most vigorous manner and knocking blood corpuscles about in all directions. Length $\frac{1}{40}$ in., breadth $\frac{1}{500}$ in. Under power magnifying 570 diameters they appear perfectly homogeneous and undifferentiated. Dr. Manson & others however describe bases of a mouth and abuminating canal being visible under high power. From the round blunt head the body extends with about equal diameter till latter third of its length, when

it begins to taper off and soon becomes all but invisible in a long and very fine back or tail. Dr. Lewis, who has carefully studied the development of the embryo, describes this back as being part of a very delicate non-contractile integument with which the embryo is provided and within which its body is incessantly shortened and elongated. This integument is really the chorion envelope which is not inspired but merely stretched and adapted as covering to embryo. Having thus spare room within its sheath, an appearance of back is present, alternately at head or tail according as the embryo is working backwards and forwards. I have studied the embryo frequently when movements were sufficiently languid to permit of close observation but though never failing to find back present at tail of animal I have not been fortunate enough to detect its transposition to head.

Most activity seems present in tail of embryo, as while head merely pushes against corpuscles here & there the tail is seen lashing about in a most marvellous manner.

Embryos live a long time after withdrawal from body. In a carefully prepared slide Dr. Myers of Toronto discovered one still alive, after 8 days.

While engaged investigating the prevalence of Filariae embryos in the blood of his hospital patients Dr. Monro made the interesting discovery, since abundantly confirmed by independent observers, that the embryos own a certain periodicity in their appearance there. In lymph this periodicity is not observable. In blood however, while

File. General Customs Medical
Report for March, 1881.

as a rule entirely absent, or present only in very sparse numbers, through the day, between 8 and 9, p.m., with marvellous regularity, they appear and steadily increase in numbers till about midnight when they begin to fall off, and by 9 a.m. are all gone. I have often examined blood at about 7.30 p.m. and perhaps after long and careful search discovered embryos. A second slide taken half an hour or more, later in the evening, would swarm with embryos.

Much speculation has been raised about this, cryptic appearance and disappearance. On first hearing cause of fact I thought the evening appearance might be connected with flow of chyle into blood after the assimilation of the evening meal, particularly of my Chinese about 7 p.m. or earlier. Born in lymphatic system I thought the embryos might be swept into blood during the increased activity of lymphatics and lacteals.

Observations made after the morning meal however proved this supposition wrong: no filariae being found in blood.

While still puzzling over the undoubted fact, Dr. Manson came forward with a novel and interesting observation. The mosquito he asserts is the 'nurse' of the embryo, and in obedience to a common law of nature the periods of activity of quest and host are identical. The embryos leave their birthplace in lymphatic system in search of further development. The blood affords a chance of being abstracted by some blood sucking animal. Within such an animal the intermediate

stage of existence and development might be passed. So argued Dr Manson, and directing his attention to mosquitoes, he found his premises to be correct. The mosquito, he proved, is to the *Filaria Bancrofti*, what the pig is to *Yersinia* *solium*, or man to the *Yersinia chinensis*. Mosquitoes seem to have an elective power for filarial embryos, many more being found present in their stomachs after ingestion, than in a quantity of blood, obtained by puncture, equivalent in bulk to that extracted by mosquitoes. A synopsis of the metamorphoses described by Dr Manson as occurring to embryos within stomachs of mosquitoes is given below. 3 stages are noted.

+ Note Chinese Customs Medical
Report. Apr. Sept. 1877.

1st. A few hours after ingestion, transparent & apparently undifferentiated embryos becomes transversely striated. Integument disappears and naked annular annulus about. Oral movements are now visible. Transverse striation yields to a peculiar spotted appearance suggestive of development of some vitelline material. 36 hours complete these changes.

2nd. Embryo enters a kind of chrysalis condition. Body becomes shorter and broader and all motion ceases except in extreme tail. Mouth and alimentary canal developed. Towards close of this stage body again elongates, tail gradually disappearing.

3rd. Continued elongation of body, from $\frac{1}{10}$ in. to about $\frac{1}{8}$ in. Mouth four lipped and funnel shaped. Movements now begin again. Certain papillary appendages are developed which Dr Manson supposes may be a boring apparatus. Finally the *Filaria* becomes markedly active, rushes to and fro and appears perfectly at home in the water, in which, after death of mosquito, it is immersed. "This formidable animal," Dr Manson says,

"is undoubtedly the *Plasmodium Sanguinis Hominis*, equipped for independent life, and ready to quit its nurse the mosquito."

The further history of the embryo is a matter of speculation. Escaping into the water in which the mosquito dies, it is probably swallowed by man, and makes its way to its selected resting place, the lymphatics, through the alimentary canal.

Many interesting points with regard to the life history of this parasite remain yet to be solved. The disappearance of embryos throughout day, is supposed by Dr. Myers of Toronto to depend on a diurnal destruction of embryos in blood with production of new *Parasites* every night.

Dr. Manson, on other hand, believes that the embryos during the day congregate in some internal organ, such as the lungs, and hence acting as suckers they remain fixed to inner wall of bloodvessels till night again comes round, when they reappear in systemic circulation. Dr. Myers' view is very improbable. It is difficult to understand that embryos, which will live for 8 days after removal from body, should have an existence of but 12 hours in blood, where they are perfectly at home. Again, the enormous number of embryos which must be present in many patients' blood militates against view of diurnal reproduction. Dr. Manson's experiments to prove the lungs the day residence of the embryos, are unsatisfactory. He killed a number of dogs through the day and certainly found that the blood from

tracheles of pulmonary artery contained many more embryos
 than that from any other organ of body. But *Filaria immitis*
 the mature female belonging infesting the dog resides in the right
 ventricle, many of the worms extending into the pulmonary artery.
 It would be but natural to expect embryos most numerous
 in lungs. *Filaria immitis* has its habitat in haemic system,
Filaria bancrofti in the lymphatic. In the dog embryos are
 found present throughout the day but become much more
 numerous at night. This certainly would suggest that
 the evening was the selected time for the female worm
 to discharge the contents of her uterine tubes into the
 circulation. In man, affected with various lymphatic
 obstructions of scrotum or glands, and where opportunity is
 thus presented of always obtaining lymph, living embryos
 will be found, in great majority of cases, throughout the
 day, in the lymph. It is in evening only, as a rule,
 when the fresh anasarca is poured into the circulation, that
 the blood is invaded. Dr Stephen Mackenzie* has succeeded
 in inverting the usual order of things and produced the
 appearance of *Filaria* embryos by day, in the blood, with
 absence throughout the night. This was effected by changing
 his patient's habits, keeping him on duty all night and
 allowing him to sleep by day. Rest and darkness
 would thus remove the conditions required for the migration
 of embryos into blood. That the parent worm is affected
 by the state of health of its host is abundantly proved
 by the constant presence of *Filaria* embryos in blood

*We often find a few embryos
 in blood examined by day.

*British Medical Journal

for Oct. 22nd 1881.

The Etiology of Elephantiasis disca.

I. Theory of Malarial origin.

throughout the day, when general fever is present.

Each new known malarial parasite renders it probable that embryos of plasmodia live some time in man. Where their retreat is throughout the day we as yet cannot tell. Many observers are now in the field, at home as well as abroad, and we hope shortly that what now is problem may be made plain. . . .

We pass on now to examine the evidence advanced in favour of the malarial and Parasitic theories respectively of the causation of elephantoid disease.

Ist. In the obstruction to circulation of lymph, and inflammation of lymphatics, a sequence and result of fever of a malarious origin?

The onset and periodical augmentations of elephantoid disease are almost invariably accompanied by fever. I say almost, as many well authenticated cases[†] have been recorded where elephantiasis has been established without any history of fever whatever.

Is this fever a true malaria, or does it deserve a specific name for itself of 'elephantoid fever'? Is it the forerunner of the disease, or merely symptomatic of a local disease?

Considerable difficulty presents itself to satisfactory solution of these questions. Patients with elephantoid disease rarely seek advice at hospital ere disease is well established. Elephantoid disease is endemic in countries where malarious fever abounds and patients are in the habit of naming every attack of

[†] Elephantiasis' a lecture by
W. Richard M. B. S. Nilsen
diseases of India by G. Fox & Tarquair

inice and temperature, unaccompanied by specific eruption, "Fever & aequa". Again, in patients who have severely suffered from aequa, any local inflammatory affection may prove an exciting cause, and be complicated or completely obscured by the recurrence of a paroxysm of malarial fever.

Remembrance of these facts prepares us to receive, in a critical spirit, the statement of 90% of our patients, viz. that the onset and periodical augmentations of their ailment were always secondary to attacks of malarial fever. The fever occurring in elephantoid disease is described by patients as presenting a cold and hot stage. Little mention is made of sweating. The hot stage lasts irregularly for several hours or days. A history of distinct intermissions, and recurrences at fixed periods of the day, of the fever, is rarely given by patients.

Quinine, but more especially arsenic, has a controlling effect over the fever, but not more so than over "catheter" or "Fever following Catheterization" or "Angine fever, generally."

The irregularity observed in the recurrence of the attacks of fever in elephantoid disease, strongly militates against its malarial nature. While in some cases monthly or even weekly periodicity is observed, in others equally characteristic of the disease, one initiative attack of fever only occurs, or intermissions may extend to 6 months or even one or two years.

Certain differences, as regards effects produced in patients, exist between malarial and so called elephantoid

+ Vide Appendix, Case III. P. II

" " " Case I. Page I

" " " Case III. Page VII

Fever. Dr. Richards[†], of Balasore, records the following,

[†] *Vital Statistics of India* by Dr. F. C. Farguhar. Page 137.

- (A) Anaemia and Anasarca, common sequels of malarial fever, are rarely observed as sequels of elephantoid fever.
- (B) The enlarged spleen typical of repeated attacks of ague, is seldom found present in elephantoid patients.
- (C) Debilitating effects to constitution generally, are more marked after malarial fever, than after elephantoid.

Then these distinctions my own experience enables me heartily to concur in. It has often been a marvel to me, to see a patient with marked elephantiasis of legs, and history of three or four recurring attacks of fever monthly, still present a comparatively robust and healthy appearance. Elephantiasis of legs with its accompanying attacks of fever may persist in a patient for years without ever once rendering him unable to perform his daily routine of work. This of course is exceptional, but still the healthy appearance presented by victims of elephantoid disease, is in striking contrast to the anaemic, washed out look, of ague stricken patients.

Much discrepancy exists, among observers of elephantoid disease as to the preponderance in time of appearance, of the fever or local inflammatory symptoms, in the onset and periodical augmentations of the disease. Chinese patients are not a particularly intelligent class and it is often extremely difficult to obtain accurate information. The phenomenon of fever dominates the minds of the great majority of patients. The common

history received is, that after one or two hours, or perhaps days, of fever, pain was experienced locally in part affected, shortly followed by redness, and by time swelling had occurred the fever commenced to abate. Certain observers in India⁺ however, who have made the initial phenomena of the disease a special study, assert, that in every case where careful observation or enquiry was made, a history of pain and tenderness of the glands always preceded that of onset of fever. Are we then to accept the fever as merely symptomatic of the local affection of the lymphatics and glands? Limited experience will not justify any decided conclusion, but certainly as far as facts go, I ~~entirely~~ see no reason to suppose elephantoid fever, other than a mere symptomatic fever.

⁺ Vide "Skin diseases of India" by Dr. J. C. Farguhar. Page 145.

It is easy to understand how the phenomenon of fever dominates a patient's mind in detailing the history of his illness. Minniger⁺, writing on Elephantiasis, says, "Some authorities state that the local disease is often preceded by violent fever. This cannot be regarded as at all singular, as in other inflammations the febrile disturbance is generally most severe at the commencement of the attack, and attracts attention before the functional disease becomes apparent".

⁺ Minniger's Practical Medicine Vol II. p. 402.

Regarding then the distinction is lymph circulation and inflammation of the lymphatics, as the Cause, not Sequence, of elephantoid fever so called, we must look elsewhere than to Malaria in our

Search for the proximate cause of elephantoid disease.
Is it not more probable that obstruction to the circulation of lymph, within certain limited areas, should depend on some locally operating cause? Of such, the second and more modern theory of the etiology of elephantoid disease treats, and we must now enquire,

II.nd Is elephantoid disease the result of the presence, at one time or other, in the body of the affected individual of an Entozoon, the Filaria Bancrofti?

Early led to suspect, from their very frequent association, that filariae and elephantoid disease were related, as cause and effect. Dr Lewis speculated that the latter disease was induced by blockage of the smaller capillaries and lymphatics, by the filariae embryos.

Dr W.D. Palmer, who independently discovered embryos in urine a few months after Dr Lewis, concluded from his researches, that "the elephantoid disease, and chylous urine, depend upon occasional and temporary occlusion of lymphatic glands by an accumulation in their minute vessels of the little haematizoon"

⁺ Indian Medical Journal
August. 1873.

Dr Manson, arguing from his study of the pathological conditions produced in the dog, by its pest the Filaria immitis and the Filaria sanguinante, at first credited the parent worm as the cause of the lymphatic disturbances in man. He supposed the worm's habitat, in man, "to be on or in the lymphatics, the receptaculum chyli, or thoracic duct, or some blood vessel in the neighbourhood of these"

= Chinese Customs Medical
Report for Apr.-Sept. 1875.

I conjecture, Dr. Manson says, "that as the animal is developed it becomes surrounded by an increasing tumour as in the dog, and that this tumour, by pressure on the outside, or by bulging into the wall of a lymphatic vessel, causes an obstruction to, or perhaps a complete stoppage of, the flow of lymph".

Further study however, led to abandonment of this theory. The free anastomoses which exist throughout lymphatic system soon convinced Dr. Manson that blockage of one or two vessels could not materially obstruct the circulation of lymph. Such obstruction also would be gradually developed, and afford ample time for neighbouring lymphatics to enlarge and carry on the circulation. In later research Dr. Manson discovered the presence of ova in lymph, each containing within it a coiled up filaric embryo. He concluded from this observation, that the parent worm was viviparous, and that the ova discharged from parent worm, which latter he believed occupied some lymphatic trunk distal to the glands, were carried by the lymph current to the glands, and (being too large to pass ($\frac{1}{500} \times \frac{1}{750}$)) were arrested there till hatched. The free embryos, with diameters not greater than a lymph corpuscle, and possessed of vigorous movements should easily be able to traverse the glands, much more likely that obstruction to the lymph circulation through the glands should be occasioned by the parasitic ova.

Subsequent opportunity however of examining the uterine tubes of the female parent worm convinced Dr. Manson that she was viviparous. Reasoning from the undoubted fact of his former discovery of ova, he now supposes these ova

Chinese Customs Medical Report
Apr. Sept. 1879.

have been the result of an abortion. Dr. Lewis confirms this supposition, as in describing the development of the embryo he shows that the chorionic envelope is not burst, but merely stretched so that an embryo *Filaria* escaping from the vagina its shell becomes its sheath.

Notified by knowledge of above facts, Dr. Manson, in a communication he was kind enough to send me but not yet printed, words his explanation of the mode in which lymph obstruction is occasioned by *Filaria bancrofti*, thus,

"If from some cause or other the embryos should be hurried into the lymph before the stretching of the chorion commences, what will be the consequence to the human host? In its unobstructed condition the ovum measures $\frac{1}{500}$ " x $\frac{1}{750}$ " or thereabouts. Its smallest diameter is thus five times greater than that of the fully formed unobstructed embryo we usually encounter in the lymph and blood. It is not too large however to pass along the vessels, but when the lymph stream has carried it to the glands it is immediately arrested, for there the afferent vessel breaks up into many minute branches which end in the solid parenchyma of the gland. The imprisoned embryo has no power to aid its onward progress but lies like an embolus, plugging the vessels and damming up the lymph. There will then be complete stasis of lymph in this particular vessel as far back as the first anastomosis in lymphatic. Along this, the current will now pass carrying with it other ova, these in their turn to be arrested

I. Theory of parasitic origin.

Dr. Mann

Number examined	Helminths found in	Percentage	Proportion
670.	62.	9.25.	1 in 10.8.

- at the first gland they reach, and the process of embolism, division
- of lymph, diversion of current into anastomoses, will go on
- until the whole of the lymphatic glands, directly or indirectly connected
- with the vessel into which the parent parasite ejects her ova, are
- rendered impervious, provided the supply of embolic ova is
- sufficient, kept up long enough, or renewed from time to time".

This then, as proclaimed by one of its most able advocates, is the modern theory of the etiology of elephantoid disease.

Let us examine more in detail the main facts somewhat faint like fabric and beginning with its foundation we must ask, Is the association of *Filaria sanguinis hominis* with elephantoid disease, a fact so clearly established, as to carry conviction to the mind that in some way or other the parasite must act as cause?

To determine this point the blood of all the in-patients of hospital was systematically examined between the hours of 8, and 9, p.m. Dr Manson's directions with regard to details of examination were faithfully followed, and the following were the results obtained.

Number examined	Filaria found in	Percentage	Proportion
463.	54.	11.44	1 in 8.57

For sake of comparison Dr Manson's table, made in Hong Kong with a similar view, is given in opposite page. His observations were made previous to knowledge of the nocturnal habits of the *Filaria* embryo and thus no strict attention was paid to

conducting the examination of blood only in evening. Making allowance for this, and also for a certain amount of inaccuracy in my own table, the degree with which the general population of the Fokien Province of China, is infected with *Filaria Bancrofti*, may be roughly estimated as 1 in 8.

The diseases, if any, presented by the 54 individuals in whose blood *Filaria* embryos were found, are detailed below.

Syphilis	10
Dyspepsia	6.
Lymph scrofula	5.
Anaemia	4.
Ulcers of leg	4.
Gonorrhoic lida	4.
Chronic Rheumatism	3.
Fistula in Ano	2.
Cataract	2.
Chyluria	1.
Brucis	1.
Haemorrhoids	1.
Carcinoma	1.
Neuritis of Tibia	1.
Curvature of spine	1.
Lumbago	1.
Phthisis	1.
Inflammation of foot	1.
Healthy ⁺	5.
Total	<u>54.</u>

⁺ Friends of patients, hospital
Atsukashi, Yokohama.

The table below, is built up on data supplied by Dr. Manson. He arranges his figures in another fashion, bringing forth somewhat different results. The principal alteration made is bracketing 'Enlarged & Varicose groin glands' with 'Other diseases' instead of as Dr. Manson does with 'Elephantiasis disease'. As the glands were only examined in patients whose blood presented filariae, no significance can be attached to the ratios represented as having filariae.

Disease	Number examined	Total	Number of filariae Cases	Total Filariae cases	Proportion affected	Percentage
Elephantiasis disease						
Elephantiasis of leg	10	42	1	19	1 in 2.21	45.23
" " Scrofula	15		4			
Lympho scrofula	13		10			
" " + Chyluria	2		2			
Inflamed scrofula & fever	2	628	2	43	1 in 14.60	6.84.
Other diseases	410		14			
Enlarged & Varicose groin glands	23		19			
Healthy	195		10			

Relation of Filariæ Paras to Elephantoid disease is shown in following table,

Disease.	number examined	Totals	number of Filariæ cases	Total Filariæ cases	Proportion affected	Percentage
Elephantoid disease						
Elephantiasis of leg	12	29	5	6	1 in 4.83	20.68.
" " Scrotum	9					
Lymph Scrotum	7					
Chyluria	1					
Other diseases	436	436	38	43	1 in 10.13	9.86.
Neurosis			5			

The facts apparently taught in foregoing tables may be enumerated thus,

I. A large proportion (1 in 8.) of the general population of this part of China (Fokien province) are infested with Filariæ.

II. The great majority of such affected persons present no apparent morbid conditions traceable to their entogenous quest.

III. Filariæ and lymph Scrotum are so frequently associated as to make it most reasonable to suppose they they stand in relationship to one another, of cause and effect respectively.

IV. The association of Filariæ with Elephantiasis of leg or Scrotum is not greater than can be satisfactorily explained by mere coincidence.

From observations of Dr Lewis, Carter, Palmer &c it has been clearly proved that Chyluria, like lymph Scrotum, is so frequently associated with presence of Filariæ as to establish a similar presumable relationship of cause and effect.

Elephantoid disease is thus split into two great classes by the Filaria line. On one side, lymph scrothum & Chyluria both are but constantly associated with presence of Filaria; on the other, Elephantiasis in which the proportion of Filariae found is not greater than that of general population. Must we then recognize an essential difference in the etiology of these two classes? Elsewhere we have accepted D'Onofri's argument to prove their pathological identity, here again he comes forward in support of a similar etiological identity. Discussing of complete obstruction to lymph circulation through plugging of glands by ova, D'Onofri says, "If the lymphatics fail to rupture there is complete stasis of lymph, and excessive accumulation in the tissues on the distal side of the glands; solidification of the glands and tissues, and Elephantiasis results. No embryos are found in the blood, as none can pass by the glands, and the parent worms or worms, probably die choked, as to speak, by the stagnant and organizing lymph, and their own young. Consequently in pure Elephantiasis as a rule, no embryos can possibly be found in the blood or gland-lymph."

+ Chinese Customs Medicine Report
Apr. Sept. 1894. p. 43.

According then to this argument in every case of Elephantiasis the Filaria Bancrofti has at one time or other been present in tissues, started the mischief and then perished in consequence of its own mischief.

"Abortion & expulsion of
premature Filaria embryos"

Facts certainly do indicate that both in Elephantiasis & lymph scrothum obstruction to the circulation of lymph, in the parts affected by the disease, may be so complete that while lymph from scrothum or glands, as case may be, abounds with embryos,

not one can be found in blood, whether examined by night or day. That elephantiasis disease continues to exist and even to increase after death of the parent worm, is easily explained. Lymphatic vessels, once varicose, are rendered permanently inefficient, and though the original cause of the obstruction be removed, growing and their own weakened walls lead to constant aggravation.

The first case of lympho scroton, detailed in Appendix, is a most interesting illustration of this fact. The patient came to hospital with a history of having suffered from his first attack of fever and inflammation of scroton, 8 years previously. Appendix Case I. Page 1.

For three years after the commencement of his illness the fever and inflammation of scroton continued to recur at intervals. About this time probably the parent worm perished as no further fever or recurrence of inflammation occurred. Scroton mischief however continued steadily to increase, lymphatics became more and more varicose and two years previous to admission, lympho discharges commenced to occur. On admission, careful and repeated examinations of blood and lymph from scroton and groin glands failed to discover a single embryo filaria. This pointed to certain death of parent. Ample confirmation of this was received. The whole of affected tissue of scroton was removed. Seven months after the operation patient presented himself at hospital for inspection. The flaps composing new scroton were found perfectly normal. Not a dilated varicose lymphatic vessel or a single vesicle could

be found. No discharge of hyaline wholeness had occurred from scrotum, nor had there been any recurrence of fever.

But in some cases of Elephantiasis of old standing filarial embryos are found present in blood. Whence come they if the rule be that parent worm rapidly perishes? Such cases are explained by supposing several mature female worms present in different parts of lymphatic system of same individual. That particular female in leg or scrotum, as case may be, and from whose abortions the lymph obstruction arise, perishes. The embryos present in the blood are the offspring of other females quite unconnected with the disease.

Case II in Appendix identifies this well. The patient had suffered from lymph scrotum for 20 years. The female worm occasioning the disease was probably situated in the scrotum when it remained undisturbed for about 10 years, when, perhaps occasioned by its death or some anomalous condition, abscess of scrotum resulted and worm was probably removed in the pus discharged. On coming to hospital, lymph from scrotum and groin glands was carefully and repeatedly examined for filarial embryos but none were found. Blood from finger examined in evening showed numerous embryos on every slide. Scrotum was removed and after operation embryos found as numerous in blood as before.

Giving due recognition to the exceeding probability of Dr Meunier's theory, and allowing likewise the confirmatory evidence advanced above, it must still

be granted that at present the theory is built more on analogy and speculation than on facts. Further research may shortly supply the desideratum of fact. Till then a somewhat sceptical frame of mind is desirable, as in looking hard for proofs of other modes of causation of elephantiasis disease we are most likely to confront facts which shall convince us of the truth of the Parasitic theory of its origin.

Looking to the parts of body commonly affected in elephantiasis, the unsupported scrotum, and leg in which gravity has such powerful play, it is easy to see how, if absorbent vessels be once seriously impaired, the whole subsequent phenomenon of progressive enlargement occurs. May not the parasitic cause be but one, granted a prominent one, of several others capable of initiating this mischief in lymphatic system. Now and then a case of what we might call 'sporadic' elephantiasis occurs in leg of an individual who has never left the shores of Britain. Reasoning from such a fact it is easy to explain a greater frequency of the disease in the East, as many more exciting causes are supplied. By far the greater majority of patients affected with elephantiasis belong to the agricultural class. Constantly going about with their feet uncovered, wading most of their time in stagnant pools or paddy fields flooded with water, rich in sewage, it is not difficult to understand how a foot may be attacked by a low form of cellulitis. Inattention to treatment would leave some permanent thickening of skin and cellular tissue. The mischief done to absorbents would make recurrence

of inflammation always liable, and no lack of existing causes being supplied, a 'perruon' elephantine leg would soon result.

A neglected ulcer of leg or foot again, might prove starting point of an elephantiasis. I have seen enormous feet, the result of neglected ulcers, and where the course, thickened, though non-intercalated, skin closely simulated the appearance of true elephantiasis.

The Scrotum is not so exposed as the leg to external causes of inflammation. From facts however that, on two occasions at least, Perverse worm has been found inhabiting Scrotum and never as yet found in leg, we are warranted in expecting the Scrotum to be equally affected with the leg by elephantiasis, owning a parasitic origin. In this part of China cases of elephantiasis Scroti are few in number compared with similar affection of leg. I have no reliable statistics to offer, but, judging from cases presenting themselves at hospital, 1 to 20 would I think represent the ratio 'big Scrotum' bears to 'big leg'. From this I think we are justified in suspecting that elephantiasis of leg owns other modes of causation, besides the Parasitic.

The answer then we would give to the question asked on page 28 is as follows,

Lymph Scrotum and Chyluria in all reasonable probability owe the presence of the Entozoon 'Filaria Bancrofti' as their proximate cause. Elephantiasis Scroti in relationship to lymph Scrotum pathologically, may be strongly suspected

On neither occasion was there any special fever or exacerbation of the disease present at moment of fluid to render it significant.

of having a similar origin. Present ascertained facts however would suggest that elephantiasis may be the result of one of several distinct causes, the most prominent place amongst which perhaps may be conceded to the Filaria parasite.

We forego, from lack of experience, to enter on a critical discussion of the mode, in which Dr. Osann supposes lymph obstruction to be produced by filariae.

The theory is ingenious, the most reasonable yet presented, and adapts itself in the most convincing manner to the phenomena of elephantine disease. Irregular paroxysmal augmentations of the disease are explained by paroxysmal discharges, from parent, of nematode ova. The facts supporting the theory are as yet very slender. On ^{two} occasions only have ova been found. Once in lymph from groin glands of a patient suffering from elephantiasis of legs, and again, in lymph from a case of lymphoedema. In the former case we would almost be led to believe that the ova had successfully passed the small branches into which afferent lymphatic vessels had divided, and been lodged in parenchyma of gland, which point it may be presumed the hollow needle reached, on puncturing.

= "Pearl embryos".

+ Chinese Customs Medicine Report for Apr. Sept. 1879.

It has still to be decided whether the inflammation of the lymphatics and accompanying cellulitis is secondary, to obstruction of lymph circulation by passive unrelenting oedema, or primary, produced by irritation caused either by ova, or more probably the anomalous condition in which female

worm must be, at time of aborting.

The selected seat of the female worm, Dr. Manson supposes to be some lymphatic trunk, in section a-fig. as case may be, distal to the inguino femoral glands.

He advances the following facts in proof of this,

I. Embryos may be found in lymph, from a lymph section, or from glands in elephantiasis, where the blood is perfectly free of them.

II. Ova have been also found in such lymph, pointing to the source of parent worm and that it must have resided on distal side of glands.

III. Adult fruit of parent worm in a lymphatic trunk, in section.

It is difficult to account satisfactorily for the marked variety of glands as often met with in lymph sections, on the supposition that obstruction to the circulation of lymph is on their distal not proximal side. Some ova may work through the superficial femoral glands and come back up higher up in lymphatic system. Case D, Appendix, presented * *Wile Appendix Page I.*

Filarial embryos in blood, but none in the lymph from his lymph section or enlarged glands. The most probable explanation of this has already been given. Another however might be afforded. Were the habitat of the female worm one of the lymphatic trunks, lying alongside of external iliac artery and which carries the lymph from the superficial femoral glands, then the numerous groin glands could be accounted for, as also the total absence of embryos in the lymph. The worm presumably lies with its head up stream, working its way down. The embryos

Wile Page 33.

would be discharged into proximal circulation of lymph and swept into thoracic duct, and from thence enter blood.

The character of the lymph discharged, in cases of lympho scrofula, affords a valuable key to the extent to which the lymphatics are involved. The lymph may be clear and straw coloured, it may be chylous, or it may be sanguineous. In the case in which Dr. Manson found the parent worm in scrofula the character of the lymph is specially noted as clear and watery, presenting few corpuscles. The glands also in this case were very slightly involved. The clear watery nature of the lymph indicated it had come from radicles of lymphatics of scrofula and had not requilified from glands, in which case it would have been rich in corpuscles.

Milky lymph implies involvement of lymphatic vessels and glands high up, and probable requilification from thoracic duct. Bloody lymph is more difficult to account for.

Some have suggested involvement and consequent rupture of capillaries, in such cases. Dr. Manson in a recent letter to the Lancet disclaims this idea as unnecessary in accounting for the presence of blood. He argues that blood corpuscles are added to the lymph in passing through the glands, and sanguineous lymph from scrofula simply bespeaks involvement of lymphatics high up towards thoracic duct. The subject is new to me, and has not yet received sufficient consideration. The usual history in lympho scrofula cases is that the first discharge of

* Chronic Cutaneous Infection
Reports Apr. Sept. 1880.

o Lancet. Feb. 18th 1882.

lymph observed, was more or less sanguineous in nature. This occurring during acute inflammation could easily be accounted for by rupture of some small capillary in a viscous gland. In Case II, detailed in Appendix, however, the lymph discharges are noted as having been sanguineous all through the course of the disease. Some of this bloody lymph was collected in evening, the coagulum carefully broken up in morning, and careful search made for filariae. None was found. The fact of their being present in large numbers in blood, but wholly absent in bloody lymph collected in evening, would seem to corroborate Dr. Manson's view that the bloody appearance was occasioned in lymph, not from admixture with blood from a ruptured capillary, but from addition of red discs to lymph in passing through the lymphatic glands. This observation seems also to disprove the idea, I had once entertained, that filariae embryos, like blood corpuscles, might pass out of the capillaries into tissues beyond. No exchange evidently occurs in the lymphatic glands, and an embryo, born in Peruvian, must work its way through a series of glands to thoracic duct and by it enter the circulation.

Much still remains to be worked out before the parasite theory of the etiology of elephantiasis disease can be incontrovertibly established.

Looking however to the progress already made in the vast new field of study opened up the

discovery of Lewis in 1870, we have every reason for encouragement, that not only a true understanding of the etiology of the disease may be ^{thoroughly} attained at, but that also a clue may be obtained for the efficacious prevention of its further progress.

Treatment at present is purely surgical. The knowledge gained by the study of filaria is of much practical value. When no filarine embryos exist in blood or lymph, we may remove an elephantiasis scrotum or a lymphoedema, with perfect confidence of effecting a perfect cure. ^{+ Case I. Appendix.} If embryos be present in blood, but disappear after the operation, we know that the parent worm has been removed with the disease, and can be equally confident of ultimate result. When however they are still present in blood after operation, we must always remember the probability of legs becoming involved in the disease, or recurrence in the flaps of new scrotum.

I. Lympho scrofula of 5 years duration.

At first, 4 attacks of fever, each of one days duration, and occurring, from commencement of illness at intervals of about 6 wks.

First escape of lymph 6 years after commencement of disease:

sanguinous in character & at first monthly in recurrence:

latterly milky in character & discharged every few days.

Skin of penis, & prepuce, involved in the disease.

Glands of both groins, Varicose,

No Filaria embryos in either blood or lymph.

In removing disease, skin of penis was untouched. Subsequent sloughing of same teaches complete removal of all affected skin, where possible.

7 mts. after operation, patient showed himself, and now scarum found perfectly sound.

Appendix.

A. Clinical Notes of four cases of Rymph Scrotum.

Ist Worth Henry, Oct 28, Coppersmith. Native of Fochins. Adm^d Oct 10th 81.
 Patient's chief commencement of his ailment 8 y^{rs} back. When 30 years old
 had fever, ushered in with rigors and much pain in back, and followed
 on second day by pain redness and swelling of scrotum. Dragging pains
 were felt in groin and inguinal glands enlarged. Fever abated in
 severity on swelling of scrotum occurring but continued more or less
 present for about a week. Pain in scrotum kept patient in bed for two
 days. Swelling of scrotum gradually subsided in a week or two &
 patient considered himself perfectly well again. In 31st & 32nd years
 fever recurred, twice in each year, accompanied by renewed but
 less painful swelling of scrotum. During past 6 years has had
 no repetition of fever but scrotum slowly increased in size & weight.
 In 36th year on two occasions escape of a large quantity of
 bloody lymph gave relief to the troublesome, but painful, swelling.
 Throughout 37th year milky discharges occurred from scrotum
 about once a month, and during past year these discharges have
 been repeated every 2 or 3 days, the milky fluid dribbling away
 for an hour or two on each occasion.

Patient's uncle has a disease similar to his own. No other member
 of family suffers, as far as patient knows, from any form of elephantiasis.

Scrotum on examination is found about 4 times its
 natural size. Skin, both of penis and scrotum, is thickened, to touch
 has a soft plastic feel, and its semi-transparent peculiar
 appearance is eminently suggestive of lymphoid tissue.

The whole surface is one mass of varicose lymphatic vessels with numerous large vesicles formed here and there, at points of exaggerated dilatation. On pricking a vesicle an escape of milky fluid occurs and continues to drip away for an hour or two at a time. Under microscope numerous lymph corpuscles are seen. Varicose lymphatic vessels can be traced, running in bundles, up into either groin. No distinct enlargement of inguinal glands exists, but in either groin a mass of varicose lymphatic vessels can be felt.

Repeated careful examinations of blood from finger and lymph from scrotum, fail to reveal the presence of filariform embryos.

Oct. 14th. Diseased portion of scrotum removed. On making incisions a free escape of lymph occurred. Testicles were found normal. Urinal flap operation was performed. Skin of penis was left untouched. After removal the diseased portion of scrotum shrunk remarkably, the emptied lymphatic vessels collapsed and very careful examination would be required to pronounce it otherwise than strictly normal tissue.

Nov. 25th. Dominated well. Scrotal wound healed up kindly. Skin of penis during 2 days following operation became acutely inflamed and subsequently ~~inflamed~~ ^{inflamed} sloughed, leaving penis to granulate over.

April 6th 1892. Patient to day returns to hospital to show himself. Flaps of new scrotum were found perfectly normal and nowhere was vesicle or varicose lymphatic seen. Patient states he has been perfectly well since leaving hospital, having neither had recurrence of fever or any appearance of discharge from scrotum. The varicose lymphatics previously found in groins are now just observable.

II. Lymph scrofulum, with incipient elephantiasis and varicose groin glands, of 4 years duration.

Onset of disease attended with fever, apparently malarial in character and intermittently present for several months. No recurrence.

Rapid formation of vesicles and early discharge of sanguinous lymph.

Slow enlargement of scrofulum with monthly discharges of lymph, latterly clean & straw coloured.

Sclerotic embryos present both in blood and lymph.



See. Lx.

II Sa Yee. Oct. 24. Fishmonger, native of Hong Kong. Adm. May 14th, 1881.

In enjoyment of previous good health, 4 years ago patient was seized with severe fever, which in big rigors, and followed after one or two days by acute inflammation of scrotum. Much swelling occurred but was relieved after a few days by free escape of a bloody fluid from scrotum. Patient states that the fever was intermittently present for several months, each exacerbation being accompanied by renewed pain, redness & swelling of scrotum, ultimately relieved by discharges of bloody fluid. Inguinal glands enlarged simultaneously with scrotum. For past three years patient has been perfectly free from fever, but scrotum has slowly been becoming 'more large, more large' and discharges of clear straw coloured fluid have occurred monthly or oftener. No history of chyluria.

Scrotum, on examination, is found about 4 times its natural size. Skin is much thickened, corrugated, and of a dirty bluish colour. Its surface is covered with numerous lymphatic vessels, gorged with lymph, and many here & there presenting vesicle like protuberances. Skin of penis is unaffected. In both groins inguino-femoral glands are enlarged and have a peculiar 'woolly' feel as if composed of a bundle of varicose lymphatic vessels with little or no connective tissue between. When patient stands and especially if he bends forward & strains, the glandular swelling becomes very marked. On recumbent position, a little pressure with hand reduces glands to almost normal size.

On pinching a vesicle, lymph slightly tinged with blood escapes and continues dripping from puncture for over an hour. Coagulation occurs in 30 min. Under microscope numerous lymph corpuscles found. Filarine embryos are found numerously present both in the lymph and also in blood from finger.

III. Lymph scutum, with incipient elephantiasis & varicose groin glands, of 2 years duration.

Onset of disease marked by one attack of fever, apparently of malarial type, no recurrence.

Lymphs, clear & chamo colored, first discharged from scutum one year after

onset of disease; recurrence at first monthly, latterly 3 or 4 times a month

No filariae embryos found in either blood or lymph.

Patient is fairly nourished and enjoys average good health. In poor circumstances, his diet has always been indifferent in quality, consisting principally of rice, salt fish and pickled vegetables. It has been his constant habit to drink water direct from well in neighbourhood of his house, without previous boiling or filtration.

No abscission, as far as patient knows, suffers from any form of elephantiasis disease.

May 20th. Scrotum in great part removed. Much bloody lymph escaped on making incisions. Testicles found normal. Examination of portion removed, reveals on cut surface many patent orifices of lymphatic vessels down which a probe may be passed. The skin shrinks considerably after escape of lymph but it is still much thicker than normal and cellular tissue is largely replaced by the semi-gelatinous, semi-fibrous tissue peculiar to elephantiasis Arabum.

July 5th. Patient dismissed well. Recovery was uninterrupted and wound is now firmly united. No vesicles or varicose lymphatics to be seen on any portion of the raw scrotum. Numerous emboli still present in blood.

III Kuny Ka. Oct. 41. Peasant. Native of country village near Tachow. Adm Oct 12/81.

Between his 21st & 24th years patient had been subject to frequent attacks of ague. Remained well up till 39th year when had fever, resembling to his mind, his old ague attacks, but accompanied from the first by pain, redness & swelling of scrotum. The inflammation of scrotum was severe, continued for 3 days acutely, and patient had to keep his bed for 20 days before swelling subsided. Has had no recurrence of fever since but towards end of 40th year, scrotum, which had been in interval slowly and painlessly enlarging, commenced to discharge lymph, clear & straw coloured, escaping over several hours at a time. During 41st year

IV. Lymph section of 20 years duration.

Onset of disease preceded by 7 lines; frequent recurrence at irregular intervals throughout course of disease.

Inflammation of scrotum severe, giving rise to abscess in cellular tissue.

Lympho, sanguinous in character, first discharged from scrotum 19 years after commencement of disease.

Filaria embryos present in blood, but not in lymph from scrotum or glands.

numerous discharges of lymph have occurred at first monthly but latterly every week.

Scrotum on examination is found enlarged to about three its normal size. All over anterior and most dependent part the skin is thickened and contains numerous varicose lymphatic vessels and vesicles. Varicose lymphatics can be traced up with cords into ether groin, where they enter a series of markedly varicose glands. The recurrent posture reduces size of scrotum and glands considerably. Microscopic examination of fluid discharged from vesicles, reveals numerous lymph corpuscles but no filarine embryos. Repeated search of blood at 9 p.m. proved equally unsuccessful in finding embryos.

Oct. 16th. Greater portion of scrotum removed. Free escape of lymph during operation. Many patent orifices of lymphatic vessels seen on cut surface of removed portion. Skin is considerably thickened and with cellular tissue presents the characteristic appearance, on section, of elephantiasis tissue.

Nov. 20th. Diminished well. Repeated examination of blood failed to find embryos present.

II. Ne Ne. Aet. 39. Fruit dealer. Native of Fochow, Adm. March 12th 1892.

Present ailment began 20 years ago. In previous good health, he was seized with fever in his 19th year, in autumn, when in with taking of cold and followed a few hours after onset by inflammation of scrotum with painful enlargement of inguinal glands. Kept his bed for a few days and swelling gradually subsided. From 19th to 26th years fever occurred twice annually, on each occasion being accompanied by recurrent inflammation of scrotum. Throughout 25th & 26th years remained perfectly well. 27th & 28th years characterized by recurrent attacks of fever

and scrofula inflammation three or four times each year. In 29th year after several hours of fever scrofula inflammation became very severe, compelled patient to keep his bed, and in course of two or three weeks abscess formed, which on being opened by a friend with a pair of scissors, gave vent to a large quantity of pus. The abscess formed in the cellular tissue on left side of scrotum. In 2nd mo. scrotum was well again. Patient remained perfectly free from fever for 2 years. From his 32nd year till now he has been subject to slight attacks of fever several times annually attended on each occasion by slight increase of swelling in scrotum, but not much pain. In present year, for first time, sanguineous lymph was discharged from scrotum by spontaneous rupture of a vesicle. Relief obtained by such discharge was so great, that once or twice a month since when scrotum has again become heavy it has been his practice to burst a vesicle with his nail and permit escape of 'bloody fluid'. No history of Chyluria. No relative, so far as patient knows, suffers from any form of Elephantoid disease.

Scrotum on examination appears about three its normal size. Skin of penis is involved and along with that of scrotum contains numerous glands and minute lymphatic vessels. Vesicles stick the entire surface, and on thrusting a needle into one of these, lymph strongly tinged with blood, spurts out as from a small artery. Firm coagulation occurs in about 7 min. 8 p.m. 10.10. Under the microscope numerous lymph corpuscles and red blood discs found. Numerous specimens of lymph were carefully searched both in evening and through the day but no feline embryos ever found. The lymph was allowed to stand over night, and in morning the coagulum remaining at bottom of test tube carefully searched, but no feline embryos found. Examination of blood at 9 p.m. revealed numerous embryos on every slide.

March 16th. Greater portion of scrotum, and skin of penis, removed. When patient was placed on the operating table, after 24 hours strict attention to his being kept in bed with scrotum raised, little or no difference from normal, was noticed either in appearance or bulk of scrotum. The whole of the ant. surface of scrotum was removed by transfixion with finger knife and cutting up and down. Right testicle was much enlarged, as was removed. Left testicle healthy. Careful examination of removed tissue was made, for parent worms, but without success. The collapsed lymphatic vessels could be easily traced out with a probe, and slit open. The skin of removed portion of scrotum was thickened and cellular tissue, in slight degree, presented appearance of Elephantiasis.

April 12th. Wound all but well. Penis rapidly granulating over. Slight fever for a day or two after operation, but no recurrence since. Filarianæ embryos still present, equally numerous, in blood.

Chyluria, of 4 months duration.

Onset of disease preceded by 7 hrs; no recurrence.

Urine at first passed exactly like milk, latterly containing curdy clots and blood.

Difficulty of micturition from clots; no increased frequency.

No vesical hyperaesthesia anywhere visible on surface; no enlarged glands.

Filaria embryos present in blood, but not in urine.

B. Clinical notes of a case of Chyluria.

Kung Kung. Aet 45. Peasant. Native of Hoke-chwang Adm² Nov¹³ 1891.
 up till 4 yrs. ago patient enjoyed good health. At this date suffered from
 fever continuously present for 3 or 4 days, accompanied by headache and
 general malaise, but no chills. Urine was high coloured but not
 otherwise affected until about one week after cessation of fever, when
 to surprise of patient, it was passed white as milk. No blood was noticed
 and the urine was perfectly fluid. Since then all urine passed has been
 milky, the white colour of late having become more intense, and during
 past month streaks of bright red blood have been frequently observed
 present. The urine now also contains white curdy clots, which in
 passing cause considerable pain. At no time has pain been
 experienced, referable to penis, bladder or kidney. No history of gonorrhoea.
 No abnormal frequency of micturition.

With exception of slight anaemia, patient seems to enjoy good health.
 Came to hospital on account of the peculiar appearance of the urine
 and difficulty experienced in passing the coagula.

Urine on examination immediately after being passed is creamy
 white and presents all the appearance of rich milk.
 The first flow is fluid, but later on jelly like clots are
 passed. On resting, over one half of the urine glass is
 occupied by coagula, but after standing for 12 hours all trace
 of coagula disappears. Sp. gr. 1020. Under microscope oil globules,
 lymph corpuscles, and a few blood discs found. Reaction neutral.
 No embryos found in urine, but examination of blood in evening reveals
 several on every slide. No enlarged glands. No massive lymphatic vessels
 to be observed anywhere. No relative suffers from elephantiasis disease.

I. Elephantiasis of left leg of 5 years duration.

Onset of disease preceded by fever: recurrence of fever throughout course
3 or 4 times annually.

Inguino-femoral glands on both sides enlarged, not ovaries.

No filarial embryos present, either in blood or lymph from glands.

C. Clinical notes of three cases of Elephantiasis of Leg.

I Mung Lung. Aet 44. Peasant. Native of Lung Kong, adm June 30th 1881.

Patient states 'big legs' and 'big scrotum' are common in his village, and that it is the regular custom of the peasants to drink water direct from wells and ponds round village, without previous boiling or filtration. His disease began 9 yrs ago. In Feb. 1873 had fever described as 'hot', cold, hot & sweating. The fever lasted for three days. On second day the left leg from knee down became swollen and tender and compelled patient to keep his bed. Swelling subsided in 10 days. Remained well till Sept. of same year when a second attack of fever occurred, with renewed swelling of leg. A third attack followed in May 1874 and since then renewed attacks have occurred two or three times a year. The left leg has gradually increased in size, every new attack of inflammation leaving it a little larger than before. The thigh was gradually involved by the swelling. During whole course of the disease, with exception of a few days in bed during each exacerbation, patient has enjoyed good general health and always been able for his work. No history of Chyluria.

His relative suffers from any form of Elephantoid disease.

Circumferential measurements,

	of left leg.	of right leg.
Thigh	= 22 in,	17 in.
Leg	= 20 in,	14 1/2 in.
Foot	= 11 1/2 in,	9 1/2 in.

Skin of left leg is tense and smooth. Thickening not marked, pits deeply on pressure. Puncture of leg with needle is followed at first by a few drops of blood and subsequent free escape of lymph

II. Elephantiasis of both legs, of 2 years duration

Onset of disease preceded by fever; recurrence several times a year
throughout course of disease.

Inguino-femoral glands on both sides enlarged, not varicose.

No Filaria embryos found in blood, or in lymph from glands.

like fluid. Gown glands on both sides, enlarged; one specially on left side, being size of a goose egg. Into this gland the needle of a hypodermic syringe was thrust and a small quantity of clear lymph withdrawn. Under microscope presented numerous nuclei and lymph corpuscles, but no filarine embryos.

Blood from finger examined on several occasions but no filarine embryos found present.

II. H. a. Oct 34. Shipwright. Native of Fochow. Adm? July 26th 1881-

Present ailment began two years ago by an attack of fever, described as "Cold & hot", and lasting for about a week. On 6th day from onset of fever the left foot and ankle became painful, red & swollen. He remained but 2 days in bed, but fully a month elapsed before swelling subsided. Since initial attack fever has recurred at first once every two or three months, but lately, monthly, accompanied each time by renewed inflammation of foot and leg. 6 mos. ago, after 2 days fever, the right foot and leg became also swollen and painful.

No relation affected with any form of elephantine disease.

Patient is robust and well built, and does not at all present the appearance of having suffered from repeated attacks of fever.

Both feet and legs up to within 2 in. of the knee are enlarged, left leg being the greater of the two. Skin is much thickened, but not indurated; is dry to feel, and on firm pressure pits.

Glands in both femoral regions are enlarged to about size of chestnut, hard and dense, not varicose. The became enlarged gradually & insidiously with feet, but attracted little attention as painful. No chyluria.

At age 15 had gonorrhea but made a good recovery. No syphilis.

III. Elephantiasis of right leg, of 8 years duration.

Onset of disease attended by fever: one recurrence, a year later.

A history of exposure to cold immediately preceding onset of disease.

Testes & glands in both sides enlarged; chiefly right.

No Filaria embryos either in blood, or lymph from glands.

Blood from fungus carefully examined at 9 p.m. but no filariform embryos found. Lymphs from enlarged glands, withdrawn by needle of hypodermic syringe and carefully examined, but no embryos found present.

III. Chen. Oct 33. Pleasant. Native of Hong Kong. Adm^d. Sept. 7th 1881 -

At age 25 patient had fever one hour very cold then one hour very hot and perspiring. Simultaneously with fever, pain was felt in right foot in ankle, shortly followed by redness & swelling. Pain was very acute and patient lay abed 48 days before swelling disappeared. Desquamation of cuticle followed on the return of skin. This first illness occurred in winter, the weather was very cold and patient had been wandering about a good deal in it just previously to onset of fever, washing night with buckets &c. Remained well till Spring of following year when again fever and inflammation swelling of right foot and ankle occurred. Again a year well in 25th year, in spring time, without any preceding fever, patient felt a gland in right femoral region very painful, soon followed by swelling: red streaks extended down thigh to leg which with foot and leg became much swollen. Swelling has persisted since, but patient has had no recurrence of fever. Complains most of the mechanical inconvenience from his big leg.

Right foot & leg are much enlarged. Skin thick and leathery, but presents no tubercles: has a purplish blue colour. Circumferential measurement

of right leg,		of left leg,	
18 ¹ / ₂ in.	=	Calf	= 14 ³ / ₄ in.
14 ¹ / ₄ .	=	Ankle	= 10 .
11 ³ / ₄ .	=	Foot	= 10 .

Femoral glands on both sides are slightly enlarged: hard, rolling

painless and not larger than hazel nuts. On right side, just over axillary opening, one gland visible, as large as a chestnut. This is pointed out by patient as that in which the pain and swelling had formerly been experienced. No enlarged glands in popliteal space.

Examination of blood at 9 p.m. fails to discover filariform embryos. On puncturing leg with needle a bloody serum fluid escapes and continues to ooze away for several minutes. Coagulation but slight. A needle of hypodermic syringe was thrust into the parenchyma of enlarged gland of right groin and a few drops of clear lymph obtained. No filariform embryos found therein.

I. Elephantiasis of Peritum, with double hydrocele, of 18 years duration.

Onset of disease preceded by Fever; repeated recurrence since.

Genital glands slightly enlarged.

No Filaria embryos in blood, or lymph from glands.

D. Clinical notes of four cases of Elephantiasis Scroti.

I. Chai, Aet 46. Pleasant. Native of Hong Kong. Adm. June 1st 1891.

Up till the age of 27, with exception of occasional attacks of dyspepsia, patient enjoyed good health. At this date a swelling, painful & unaccompanied by fever, developed on right side of Scrotum. (Hydrocele). In 28th year, no infection had an attack of fever, followed several hours after onset by inflammation of Scrotum. Kept hot for 3 days by which time skin had desquamated & scrotal swelling abated. In summer of his 29th year fever & scrotal inflammation recurred, after which scrotum never regained its normal size. From 29th till 40th renewed attacks of fever & inflammation of Scrotum occurred about three annually. Since 40 fever has occurred monthly and latterly 2 or 3 times a month. Scrotum of late has increased rapidly in size. No chyluria. No relative suffers from elephantiasis disease.

Scrotum on examination is found enlarged to about size of an ordinary football. Marked fluctuation points to double hydrocele. The skin of Scrotum is much thickened but smooth presenting no appearance of varicose lymphatic nodules. Penis completely buried. Glands of both Groins slightly enlarged. Blood many times examined; no filariae being present.

June 6th. Scrotum removed. Double hydrocele present. Lunula vaginalis much thickened and on right side presents considerable calcareous deposit. Cellular tissue of Scrotum is replaced by a peculiar white jelly like but yet tough tissue; semi-gelatinous, semi-fibrous. Immediately beneath skin would describe tissue as fibrous but deeper down, gelatinous. On making a section, with knife, the divided tissue becomes creamy.

The fibrous tissue beneath skin is not vascular, but in gelatinous tissue numerous vessels of considerable size, run. Little or no fat present. Testicles somewhat atrophied, but preserved.

II. Elephantiasis of Perineum, and prepuce, of 10 year duration.

Onset of disease during a 3rd. illness from continued, long, numerous
recurring attacks since.

Commencement of elephantiasis of left leg three years ago.

Myeloid glands enlarged.

No Filaria embryos either in blood, or lymph from glands.

July 23. Dominated well. Suffered a good deal from fever after the operation, one which I believe seemed to have little effect. On one occasion after a sharp attack of fever both feet and ankles became slightly inflamed. Ling. Arsenicals was successful in stopping the fever. Wound now perfectly healed. Abdom again examined tonight, but no embryos found. Lymph also withdrawn from the slightly enlarged glands but no filariae present therein.

II. Yang Heng. Oct 36. Peasant. Native of Huk Chuan. Adm Sept. 19th/81.

In 25th year without previous attack of fever, pain redness and swelling deemed in right side of scrotum (orchitis?) In summer of following year had a severe attack of fever lasting more or less continuously present for three mths. No pain in body or discharge, but scrotum was inflamed and became much swollen.

Between 26th and 29th years remained free from fever but scrotum continued slowly to increase in size. In 29th year was again laid up for a month with a more or less continuous fever during which scrotum increased rapidly in size. 30th year, no fever.

Throughout 31st year, fever & scrotal inflammation recurred monthly lasting a day or two on each occasion and since then, frequency of recurrence has been about 7 or 8 times a year. Glands of groin enlarged simultaneously with scrotum but quite painlessly.

3 years ago left foot and leg became swollen, the skin being red and painful. No history of Chyluria.

Scrotum and prepuce found much enlarged. Skin thickened and tuberculated. Penis is completely buried, the urethra creeping from a large slit in the enormously hypertrophied prepuce.



Yong Hung

III. Elephantiasis Scuti, of 10 years duration.

Onset of disease preceded by fever; numerous recurring attacks.

Lymphs discharged from scutum in the first year of the disease.

Gonad glands slightly enlarged.

No Filaria embryos either in blood, or lymph from glands.

lymphatic glands on both sides enlarged to about size of walnuts. In right femoral region one large gland is found. Left foot and leg slightly larger than its fellow. Skin thickened, but smooth. Does not pit.

Examination of several slides of blood made, but no embryos of larvae found. Lymphs from large glands in groin also examined but with equal success. On pricking scrotum with needle the first drops of blood is followed by several of a lymph like fluid (examined for filariae - none). Patient states that he has observed of late that on scratching scrotum a clear fluid escaped. During early stage of disease no discharge of lymph occurred.

Sept. 2nd. Scrotum & Prepuce removed. Left testicle was firmly imbedded in the gelatinous elephantiasis tissue and was only found after long search. Scrotum was really one solid tumour in which testicles were packed as seeds in an apple. The portion of scrotum removed weighed 5 lbs, and its tissue was similar to that described in the preceding case⁺.

⁺ Vide Page XIII.

Oct. 15th. Diminished well. Wound perfectly healed.

III. Seke Paire. Aet 30. Peasant. Native of Ling Hong. Adm. Oct. 18th/81.

10 years ago had an attack of fever; cold & hot, followed on 2nd day by inflammation of scrotum. Every month since, more or less, has had recurrence of fever and recurrent pain return & swelling of scrotum. 6 years ago, rendered despondent by his increasing ailment he took some narcotic herb with a view to suicide. A small fire lit by a Chinese doctor, on his abdomen proved effectual in arousing him from semi insensible state drug had thrown him into. In first year of his illness

patient states, that fluid like amniotic water dropped from scrotum on several occasions.

Patient is thin and debilitated. His mind is evidently much depressed by his ailment and it is with difficulty any particulars thereof can be gathered. Scrotum is much enlarged and measures, in transverse girth $34\frac{1}{2}$ in., in ant. post. $26\frac{1}{2}$ in. Skin is much thickened and warty in appearance. Skin of penis is likewise involved prepuce being enormously hypertrophied and likewise tuberculated. On picking one of these warty excrescences lymph slightly tinged with blood, escapes, coagulation of which occurs within 4 mins. Glands of groin are very slightly enlarged. Lymph from scrotum and also from glands examined under microscope but no filariform embryos found. Blood from fungus contains no embryos.

Oct. 19th. Scrotum removed. Testicles normal. No hydrocele. Considerable vascularity of skin & cellular tissue existed and numerous medium sized vessels required ligaturing. Removed portion of scrotum weighed $13\frac{1}{2}$ lbs. Section revealed the usual semi-gelatinous lymphoid tissue, especially developed towards raphe; lateral walls of scrotal cellular tissue presented fibrous appearance. Much lymph escaped during incising scrotum and after removal. Cut surface showed numerous gaping ends of dilated lymphatic vessels.

Dec. 16th. Drained well. Wound healed without interruption. General health of patient much improved, and mental condition notably better. Blood repeatedly examined for filariform but none ever found present.

II. Elephantiasis of scrotum, and both legs, of 18 years duration.

History of onset of disease unsatisfactory. Numerous attacks of fever.

Lymph discharged from scrotum 11 years after commencement of disease, continuing to escape at intervals up till one year ago.

Inguinal femoral glands enlarged, not varicose.

No 7 leucis embryos either in blood, or lymph from glands.

V. Chui. Age 32. Peasant. Native of Kiangsu. Adm^d Jan. 5th 1882.

Present affection, patient states, began about age of 14. He can give now particulars now of exact mode, or time, of swelling of scrotum or legs. Had numerous attacks of fever but does not associate these with the enlargement of scrotum. All the history he can give is "that every day scrotum and legs became more large, more large". When 25 years old an escape of lymph occurred from scrotum & this occurred every year since up till last. Since the lymph ceased to escape scrotum has increased in size more rapidly.

Scrotum presents ordinary appearance of elephantiasis. Prepuce is much hypertrophied and, along with ant^r surface of scrotum, markedly tuberculated. Legs below the knee are enlarged to about one half of an the normal size. Skin is thickened and arranged in folds round ankle. Glands on either side, both inguinal and femoral, are enlarged but none is bigger than a chestnut; firm to the touch, not marcescent.

Blood from finger and scrotum examined at 9 p.m. but no embryos found. Lymph expressed from punctured tubercle on scrotum, and withdrawn also from enlarged glands, examined but no fibrine found. No history of Chyluria.

Jan. 6th. Scrotum removed. Ordinary appearance of elephantiasis in removed mass which weighed 9 1/3 lbs. No hydrocele. Testicles preserved.

April 12th. Scrotum has been healed some time, but slight fistula remains on left side. Both testicles sloughed during healing and discharge kept wound open -

Filaria embryos present in blood, instead of consistent disease.

E. notes of a case where Filariae exist in blood without concomitant disease.

The Bury, Oct 29. Hospital Assistant, native of Amoy.
This case is interesting as in it date of entrance of Filariae into patient's tissues can be approximately fixed. Bury employed as assistant in D'Amour's Hospital, Amoy, his blood was many times searched for embryos, without success in finding any. Came from Amoy to Foochow 3 years ago and after assisting in hospital here for three mths. he went to Hengchow to start practice on his own account. Elephantiasis discares in all its forms is specially prevalent in district of Hengchow, much more so than in either Amoy or Foochow. After residing in Hengchow for about 5 mths. he was laid up with fever, continuous, with evening exacerbations, accompanied by slight diarrhoea, much headache, backache and pain in stomach, and by himself diagnosed as typhoid on recovery, returned to Foochow where he has since been acting as Hospital Assistant. A few mths. after return, examining his blood one night under microscope for curiosity, he was not a little surprised to find it swarming with Filariae embryos.

Before his illness in Hengchow he never had fever in his life, and since has had no recurrence. Has always suffered from a weak stomach and chest and has on several occasions spat blood. No obvious physical signs of Phthisis however can be made out.

Many parent worms must be present in body

and yet not a single ascarid, traceable to their presence, exists. I have examined his blood dozens of times and have always found numerous embryos on every slide.

Randy found them the day. On one occasion I found embryos present in bloody sputa, expectorated in early morning. No enlarged glands anywhere.

While living in Heng hwa it was his custom to drink water, in summer, direct from the common well, of the street he lived in, without previous boiling or filtration.

It is a common belief, but in my experience quite an erroneous one, that Chinese never drink cold water.

All the persons I have questioned on this point, state, that it is their constant habit to drink water direct from the wells and even ponds in paddy fields where they may be working.

The foregoing Thesis has been wholly composed
and written by me,
(Witness to Signature) (Signed)
Oct. Johnson Thos. B. Adams

I certify that Thos. B. Adams M.B. & C.M. (Grazing University)
has been engaged in the active practice of medicine
in Fochino, China during the two past years.



Oct. Johnson
for U.S. Consul

April 22nd 1882.